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March 28, 2005

Mr. Peter Goode  
Missouri Department of Natural Resources  
Water Pollution Control Program, Permit Section Chief  
PO Box 176  
Jefferson City MO 65102-0176

NPDES  
- MO  
- MAJOR  
- AMEREN UE  
- LABADIE  
- MO-0004812



Re: AmerenUE Labadie Power Plant  
NPDES Permit MO-0004812  
316(b) Phase II Proposal for Information Collection

Dear Mr. Goode:

This letter and attached plan represent the Proposal for Information Collection (PIC) to support development of the Comprehensive Demonstration Study for the AmerenUE Labadie Power Plant in accordance with the provisions of 40 CFR 125.95(b)(1).

The Labadie Power Plant cooling water intake structure (CWIS) is located on the Missouri River and has a design CWIS flow of 1,907 cubic feet per second (cfs). The mean annual flow of the Missouri River during the 1928-2002 period is 81,210 cfs, as recorded at the United States Geological Survey Gage Station 06934500 located at Hermann, Missouri. Our review of the Missouri River and the Labadie Power Plant determined that this facility is only subject to the impingement standard of the Rule, as the facility CWIS design flow is less than five percent (2.3%) of the average Missouri River flow. It is our intention to begin collection of biological field impingement data on or about May 1, 2005.

According to EPA regulations the PIC must contain the following items as summarized below:

- ☐ A description of proposed and/or implemented technologies, operation measures, and/or restoration measures to be evaluated by the study.
- ☐ A list and description of any historical studies characterizing impingement mortality and entrainment and/or the physical and biological conditions in the vicinity of the cooling water intake structures
- ☐ A summary of any past or ongoing consultations with appropriate fish and wildlife agencies that are relevant to this study.
- ☐ A sampling plan for new field studies.

Each of these items are subsequently addressed.

### Description of proposed and/or implemented measures to be evaluated

We plan to evaluate an appropriate range of technologies, operational, and/or restoration measures as part of the comprehensive demonstration study as a means of reducing impingement mortality. However, it is impossible to provide a complete and accurate list of all measures at this time due to the complex engineering, operational and biological evaluations required of each intake structure and the short time frames provided within the rule to meet PIC submittals. Some illustrative examples of measures to be evaluated for technologies include coarse-mesh Ristroph Screens, retrofit of intake bar racks and cylindrical wedge wire screens. Appropriate operational considerations such as reducing the number of pumps operating during certain times of the year may also be assessed. To the extent restoration represents an appropriate and viable alternative, consideration may be afforded to fish stocking or habitat protection program participation. All measures to be evaluated will be subject to cost-cost and/or cost-benefit criteria and the potential procurement of a site-specific standard, as afforded by the Rule.

### Historical Impingement Studies

During June 1977 the Labadie Power Plant submitted a study that demonstrated that the CWIS had little, if any, impact on the waterbody ecology. Data generated from this 1974-1975 study determined that 94.8% percent of the species impinged by the CWIS were Gizzard Shad and Freshwater Drum. This Study was approved by the Missouri Department of Natural Resources in August 1977.

Attached to this letter is an impingement sampling plan for the Labadie Plant. Additional details on the physical aspects of the intake structure, historical site impingement studies and information on fish and shellfish community are summarized in Chapters 2 and 3 of the plan to meet the requirements of this item.

### Relevant Past/ongoing Resource Agency Consultations

Currently, there are no past or ongoing consultations with fish and wildlife resource agencies that we believe would be relevant to this study. We anticipate that discussions with such agencies may be necessary as we precede though the regulatory process.

### Proposed Sampling Plan for New Field Studies

We propose to update existing impingement data to reflect current conditions in the river and plant operation. The proposed impingement monitoring plan and quality assurance plan are included in Chapters 4 & 5 of the attached document. In summary, we plan to conduct a one year impingement sampling program.

Samplings will occur over one 24-hour period at a biweekly frequency. Pending the outcome of the initial one-year sampling effort, we may elect to perform additional focused studies.

Summary

As mentioned previously, it is our intent to begin field studies on or about May 1, 2005 in order to support development of the required Comprehensive Demonstration Study. As it is critical that we obtain Agency approval prior to beginning field studies, we respectfully request that the Agency validate our plan as expeditiously as possible. Consistent with regulatory requirements, it is our intent to submit the Comprehensive Demonstration Study for the Labadie Plant CWIS by January 7, 2008.

We believe the information provided meets the regulatory requirements of the PIC. If you have any questions regarding this Proposal for Information Collection, please contact me (314-554-4581) or John Pozzo (314-554-2280).

Sincerely,



Michael J. Smallwood  
Senior Environmental Engineer

Enclosure

cc: Mr. Richard Laux, MDNR  
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**SAMPLING PLAN FOR  
THE IMPINGEMENT MORTALITY CHARACTERIZATION  
STUDY AT  
THE LABADIE POWER PLANT**

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March 2005

## SAMPLING PLAN SUMMARY

An impingement mortality sampling plan is proposed for the Labadie Power Plant, a 2300-MW facility located on the south bank of the Missouri River, 35 miles west of St. Louis, Missouri. The station is subject to the Clean Water Act §316(b) Phase II Rule for its NPDES permit, which requires that impingement mortality be reduced by 80 to 95 percent, compared to a baseline level specifically determined for the facility. To comply with this Rule, the proposed sampling plan will provide information required to complete an Impingement Mortality Characterization Study for submittal to Missouri Department of Natural Resources. This sampling plan: 1) identifies existing data on the fish community in the vicinity of the cooling water intake and on impingement occurring at the intake; 2) evaluates the sufficiency of these data to characterize current fish abundance, distribution, and impingement mortality at the intake; 3) makes a preliminary selection of Representative Species for detailed study; and 4) describes a work scope for impingement monitoring.

The Phase II Rule allows impingement mortality to be quantified using Representative Species (RS), chosen to be surrogates for other species not selected for detailed study. RS typically are those most frequently observed in impingement collections, or those deemed to be most important because of their economic value (e.g., commercially or recreationally exploited species), value to the ecosystem (e.g., abundant prey species), or societal value (e.g., threatened or endangered species). Based on impingement studies conducted during 1974-1975, the recommended list of RS includes gizzard shad, freshwater drum, and flathead catfish.

Habitat modifications resulting from flow regulation and channelization appear to have affected the abundance and species composition of the fish community in the lower Missouri River during the past few decades. Sustained trends in annual abundance could cause some species or life stages to become more or less abundant in the vicinity of the Labadie's CWIS, and thus more or less susceptible to impingement. Recently introduced species also may influence impingement rates or displace species that were impinged in the past. For these reasons, an impingement monitoring program is proposed that will update existing impingement data to reflect current conditions in the river and current operation of the station. Data produced by this program will define the species and life stages impinged, as well as their numbers and biomass on a time (biweekly, monthly, and annual) and per-volume-pumped (MG of cooling water) basis.

The table below summarizes the proposed features of the impingement mortality sampling programs.

**LABADIE POWER PLANT SAMPLING PROGRAM SUMMARY**

Program	Duration	Sampling Frequency	Data Collected
Impingement Monitoring	1 year	Biweekly over a 24-hour period, year-round	Counts and biomass by species and life stage, length frequency, scale/otolith samples of RS, specimen condition, collection efficiency, ancillary environmental and operation data

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## 1. INTRODUCTION

ASA Analysis & Communication, Inc. has prepared this Impingement Mortality Sampling Plan for Ameren's Labadie Power Plant (Labadie), located at Rivermile 57.5 on the south bank of the Missouri River, 35 miles west of St. Louis, Missouri. This plan is a component of the Proposal for Information Collection being submitted to the Missouri Department of Natural Resources (MoDNR). Under the Clean Water Act §316(b), an NPDES permit applicant must demonstrate that the location, design, construction and capacity of its cooling water intake structure represents Best Technology Available (BTA) for minimizing adverse environmental impact. The primary impacts of concern under §316(b) are entrainment of smaller aquatic organisms into the cooling water system or impingement of larger organisms onto traveling screens in the cooling water intake. However, other impacts associated with various technology or operating alternatives also are considered in reaching a BTA decision.

### 1.1 PHASE II §316(b) REQUIREMENTS

On July 9, 2004, the U.S. Environmental Protection Agency (EPA) published its final Phase II Rule under CWA §316(b). Phase II applies to existing electric generating facilities (construction commenced prior to January 17, 2002) that have cooling water intake structures (CWIS) with a design capacity of 50 million gallons per day (MGD), withdraw water from waters of the U.S., and use 25 percent or more of the water withdrawn for cooling purposes. The Labadie Power Plant (Labadie) fits this definition for a Phase II facility. Compliance with the Phase II Rule is based on achieving performance standards for reduction of impingement mortality and entrainment set by the EPA on the basis of facility location. The Rule requires that impingement mortality be reduced by 80 to 95 percent compared to a baseline level (i.e., the calculation baseline) specifically determined for the facility. Labadie is not subject to entrainment reduction performance standards because its design intake flow is 5 percent or less of the mean annual flow of the Missouri River. The design intake flow is 1,907 cfs, or 2.3 percent of the mean annual flow of 81,210 cfs for the period from 1928 through 2002 at the USGS gauge on the Missouri River 37 miles upstream from Labadie (Alden 2004). Entrainment therefore will not be considered further in this plan.

The calculation baseline is a hypothetical condition representing an intake structure located at the surface and along the shoreline of the source waterbody. The hypothetical intake would have the screen face parallel to the shoreline and traveling screens with the standard 3/8-inch mesh. No prior modifications to the configuration or operation of the intake would have been taken for the purpose of reducing impingement mortality or entrainment.

Under the Phase II Rule, plant operators must comply with the performance criteria by demonstrating that their existing CWISs:

1. Presently comply with these standards (commensurate with a closed-cycle, recirculating cooling water system) or have a design intake velocity  $\leq 0.5$  fps (relevant to impingement mortality reduction only), known as EPA Compliance Alternative #1;
2. Already comply under existing conditions or will comply after implementation of technology, operational, and/or restoration measures designed to reduce or replace impingement and entrainment losses (EPA Compliance Alternatives #2 and #3, respectively); or

3. Will meet site-specific standards set in lieu of the national standards because of implementation costs "significantly" higher than considered by the EPA or than the derived benefits (EPA Compliance Alternative #5).

The Rule also allows for reduced study requirements if an approved technology (currently limited to submerged wedge-wire screens) is implemented (EPA Compliance Alternative #4).

Besides other documents required with the submission of a permit application, the Rule requires development of a Comprehensive Demonstration Study (CDS), unless the applicant can demonstrate that its facility's intake cooling water flow is commensurate with a closed-cycle recirculating system (EPA Compliance Alternative #1). The CDS has several components, as outlined in Table 1-1. One component is a Proposal for Information Collection, which includes a sampling plan for any proposed field studies necessary to supplement existing information about the source waterbody, its fish and shellfish community, or current impingement mortality and entrainment rates. If it is determined that existing information might not accurately represent current impingement mortality and entrainment rates, the sampling plan will address proposed sampling for the Impingement Mortality (IM) Characterization Study, a required component of the CDS. This Impingement Mortality Sampling Plan fulfills this requirement for the Labadie Power Plant. Additional biological monitoring might be desirable depending on the specific compliance approach being used. Given that a compliance approach for Labadie has not yet been selected at this early stage in the planning process, plans for such additional studies are not included in this document.

## **1.2 IM CHARACTERIZATION STUDY**

The IM Characterization Study is an integral part of the CDS and the overall determination of BTA compliance. The IM Characterization Study provides information needed for development of all subsequent parts of the CDS, including the Design and Construction Technology Plan, the Technology Installation and Operation Plan, the Restoration Plan (optional), a site-specific determination of BTA (if justified), and ultimately the Verification Monitoring Plan (Table 1-1). The IM Characterization Study provides data on the rates of impingement mortality currently occurring at the plant, as well as a foundation for estimating the calculation baseline, needed for determining the levels of impingement mortality reduction being achieved at the plant, presently and in the future. The Rule requires that the IM Characterization Study provide:

1. Taxonomic identifications of all life stages of fish, shellfish, and protected species in the vicinity of the CWIS and susceptible to impingement;
2. A characterization of these species and life stages in terms of their abundance and their spatial and temporal distribution, sufficient to characterize the annual, seasonal and diel variations in impingement mortality; and
3. Documentation of current impingement mortality of these species and life stages.

In addition to these basic requirements, the IM Characterization Study can provide information necessary for the permit applicant to choose the appropriate Rule compliance alternative, such as applying for a site-specific determination of BTA. To justify this alternative, the results of the IM Characterization Study are needed to evaluate the benefits of implementing technology, operational, or restoration measures, in terms of the numbers or biomass of fish and shellfish potentially saved by their implementation.

The Phase II Rule allows impingement mortality and entrainment to be quantified either for all taxa or through the use of Representative Species (RS) as part of the compliance assessment. RS are chosen to be surrogates for other species not selected for detailed study. RS typically are those most frequently observed in impingement and entrainment collections, or those deemed to be most important because of their economic value (e.g., commercially or recreationally exploited species), value to the ecosystem (e.g., abundant prey species), or societal value (e.g., threatened or endangered species). Since biological information necessary to complete analyses for the CDS are not available for all species, we believe it is both more practical and more technically defensible to base all analyses on RS. In this sampling plan, we provide the technical rationale for a preliminary selection of RS.

### **1.3 SAMPLING PLAN OBJECTIVES AND ORGANIZATION**

This Impingement Mortality Sampling Plan has been prepared to meet the following objectives:

1. To identify and summarize existing data on the fish community in the vicinity of the plant's CWIS;
2. To identify and summarize existing data on fish impingement within the plant's CWIS;
3. To evaluate the sufficiency of existing data to describe the current fish abundance and spatial and temporal distribution of fish in the vicinity of the plant's CWIS, and the current rates of impingement mortality;
4. To make an initial selection of RS; and
5. To prepare a work scope for a monitoring program required to supplement existing information on impingement mortality at Labadie.

This sampling plan is being submitted to the MoDNR as part of Ameren's Proposal for Information Collection (PIC) for the Labadie Power Plant. The Phase II Rule encourages the MoDNR to review and comment on the PIC within a 60-day period, although sampling may begin during this period.

This sampling plan is organized to first present background information on the plant, including the source waterbody (Section 2.1), the cooling water intake design and operation (Section 2.2), historical biological data (Section 2.3), and a discussion of the need for supplemental data for the IM Characterization Study (Section 2.4). Section 3 then describes the fish community in the vicinity of the plant's CWIS, using available historical data. Section 3 also briefly summarizes life history information for RS, with an emphasis on how their life history influences their exposure to impingement at Labadie. Section 4 describes the recommended sampling scope for impingement monitoring. This program work scopes describes the recommended sampling design, sampling gear and its deployment, sample processing procedures, collection of any required ancillary information, and data analysis. Section 5 describes a quality assurance program that will address data quality concerns.

Table 1-1 EPA's Comprehensive Demonstration Study (CDS) Requirements

Requirement
<b>Proposal for Information Collection</b>
A description of the selected combination of intake technologies, operational measures, and/or restoration measures being evaluated
A list and description of previous impingement/entrainment studies and/or studies on the physical or biological conditions in the vicinity of the CWIS and their relevance to the study
A summary of past or on-going consultations with federal, state, or tribal fish and wildlife agencies and a copy of written comments
A sampling plan for any new field studies proposed and documenting: <ul style="list-style-type: none"> <li>• methods proposed and those used in similar studies in the same source water body</li> <li>• quality assurance/quality control procedures</li> <li>• description of the study area (including the zone of influence of the CWIS)</li> <li>• taxonomic identification of the sampled or evaluated biological assemblages (including all life stages of fish and shellfish)</li> </ul>
<b>Source Water Body Flow Information</b>
CWIS on a freshwater stream or river: <ul style="list-style-type: none"> <li>• annual mean flow and all supporting documentation and engineering calculations necessary to determine percentage of water body flow utilized by a facility</li> </ul>
CWIS on a lake (other than one of the Great Lakes) or reservoir with a proposed increase to the design intake flow: <ul style="list-style-type: none"> <li>• narrative description of the thermal stratification</li> <li>• any documentation and engineering calculations necessary to show that natural thermal stratification will not be disrupted</li> </ul>
<b>Impingement Mortality and Entrainment Characterization Study</b>
Taxonomic identification of the species and life stages of fish and shellfish in the vicinity of the CWIS that are most susceptible to impingement and entrainment
A characterization of the species most susceptible to impingement and entrainment including the abundance and temporal/spatial characteristics
If new information is needed to characterize IM&E, studies must be "of a sufficient number of years...to characterize annual, seasonal, and diel variations."
Samples used to support calculations of reduction of impingement mortality and entrainment; calculation of benefits must be conducted during periods of representative operational flows and flows must be documented
Documentation may include historical data that are representative of the current operation and biological conditions
Identification of threatened or endangered species protected under Federal, State or Tribal law

Table 1.1 (continued)

<b>Design and Construction Technology Plan</b>
Capacity and utilization rate of the facility and supporting documentation including: <ul style="list-style-type: none"> <li>• average annual net generation of the facility over a 5 year period (if available) of representative operating conditions</li> <li>• total net capacity of the facility</li> <li>• calculations</li> </ul>
Explanation of the technologies and operational measures being used or to be employed to meet § 125.94
A narrative description of the design and operation of all design construction technologies or operational measures necessary to meet national performance standards, and information that documents the efficacy for application with the species and life stages expected to be most susceptible to impingement and entrainment (include all design calculations, drawings, and estimates to support descriptions)
Calculations of the reduction of impingement mortality and entrainment of all life stages of fish and shellfish that would be achieved with the technologies or operational measures being adopted based on the Impingement Mortality and Entrainment Characterization Study described above (include all design calculations, drawings, and estimates to support descriptions)
Documents demonstrating that the location, design, construction and capacity of the CWIS technologies reflect BTA
<b>Technology Installation and Operation Plan</b>
A schedule for installation and maintenance of any new design and construction technologies
A list of operational parameters that will be monitored, including location and monitoring frequency
A list of activities to ensure the efficacy of the installed design and construction technologies and operational measures, to the degree practicable, and the implementation schedule
Schedule and methodology for assessing efficacy of the measures in achieving applicable performance standards, including an adaptive management plan for revisions if the standards are not being met
For pre-approved technologies (Compliance Alternative 4), documentation that appropriate site conditions exist for the technologies
<b>Information to Support Restoration Measures</b>
Explanation of why restoration measures would be more feasible, cost-effective, or environmentally desirable than by meeting performance standards or site-specific requirements wholly through use of design and construction technologies, and/or operational measures
A list and narrative description of the restoration measures in place or proposed for implementation, including species targeted
Quantification of the ecological benefits (production of fish and shellfish) from existing and/or proposed restoration measures, as well as a discussion of the nature and magnitude of uncertainty associated with the restoration measures and a discussion of the time frame for accrual of these benefits
Design calculations, drawings, and estimates documenting that the restoration measures, alone or in combination with technology or operational measures, will meet the requirements for production of fish and shellfish

Table 1.1 (continued)

<p>An adaptive management plan to include:</p> <ul style="list-style-type: none"> <li>• a monitoring plan listing parameters that will be monitored, and describing the frequency of monitoring and criteria for determining success</li> <li>• list of activities to ensure efficacy of the restoration measures, the linkages between these activities and items in the monitoring plan, and an implementation schedule for the activities</li> <li>• a process for revising the plan if new information becomes available or if standards or site-specific requirements are not being met</li> </ul>
<p>A summary of past or on-going consultations with Federal, State, or Tribal fish and wildlife agencies and a copy of written comments</p>
<p>If requested, a peer review of items to be submitted as part of the restoration plan</p>
<p>A description of information to be included in a biannual status report</p>
<ul style="list-style-type: none"> <li>• <b>Information to Support Site-Specific Determination of BTA</b></li> </ul>
<p><i>Comprehensive Cost Evaluation</i> – including detailed engineering cost estimates of the technological or operational modifications proposed in the Design and Construction Plan above</p>
<p><i>Valuation of the Monetized Benefits of Reducing Impingement and Entrainment</i> (if the site-specific determination is being sought because the costs are significantly greater than the benefits) containing:</p> <ul style="list-style-type: none"> <li>• description of methodology used</li> <li>• the basis for any assumptions and quantitative estimates</li> <li>• analysis of the effects of significant sources of uncertainty on the results</li> </ul>
<p><i>Site-Specific Technology Plan</i> containing:</p> <ul style="list-style-type: none"> <li>• a narrative description of the technologies, operational measures, and restoration measures that you have selected and information that demonstrates the efficacy of the technology for species in the vicinity of the CWIS and supporting design calculations, drawings, and estimates</li> <li>• engineering estimate of the efficacy of the technological or operational measures for reducing impingement and entrainment – include site-specific evaluation of the suitability of the technologies or operational measures for reducing IM&amp;E based on representative studies and/or prototype studies and supporting design calculations, drawings, and estimates</li> <li>• documentation that demonstrates the technologies, operational measures, or restoration measures selected would satisfy §125.94 (establishment of BTA)</li> </ul>
<p>Most of this information will be developed in the Design and Construction Technology Report</p>
<p><b>Verification Monitoring Plan</b> – two years of monitoring to verify full-scale performance of technologies, operational measures, or restoration)</p>
<p>Plan must include:</p> <ul style="list-style-type: none"> <li>• frequency of monitoring</li> <li>• duration of monitoring</li> <li>• description of yearly status report to be submitted to the Director</li> </ul>

## 2. BACKGROUND INFORMATION

This section presents a summary of available information on the Labadie Power Plant regarding its source waterbody (Missouri River), the design and operation of the facility, and previous biological studies at the plant and in the source waterbody.

### 2.1 SOURCE WATERBODY

The Labadie Power plant is located in Franklin County, Missouri, 2 miles north of the town of Labadie. It lies on the south bank of the Missouri River at River Mile (RM) 57.5 and 35 miles west of the city of St. Louis (Figure 2-1). Labadie is in the most downstream portion of the Missouri River, which stretches 2,619 miles from its headwaters at Hell Roaring Creek, Montana to its confluence with the Mississippi River just north of St. Louis, Missouri.

Over the past century, the Missouri River has been converted from a free-flowing river to a highly modified, flow-regulated river by the construction of seven major dams along its mainstem, and by channelization and bank stabilization of the river downstream of the reservoirs. Six of the dams are operated by the U.S. Army Corps of Engineers (USACE) for the purpose of reducing flood damage, enhancing commercial navigation, generating hydroelectric power, and storing water for irrigation. The six dams and the years when their construction was completed are the Fort Peck (built in the 1930s as a Public Works Program Administration project), Fort Randall (1952), Garrison (1953), Gavins Point (1955), Oahe (1958), and Big Bend (1963) dams. The seventh dam is the Canyon Ferry Dam, which is farthest upstream and was constructed, and is now operated, by the U.S. Bureau of Reclamation. The five USACE dams built during the 1950s and 1960s are the result of the Pick-Sloan Plan passed in 1944, which was prompted by major flooding in 1944 and a major drought lasting from 1930 to 1941 (NRC 2002). The Pick-Sloan Plan was formed by an agreement between the U.S. Department of Interior's Bureau of Reclamation and the USACE as a means to suit their mutual needs and as a development plan for the Missouri River basin. It is the effective management regime for the Missouri River under the authority of the USACE.

Dam construction and channelization along the Missouri River mainstem has fragmented the river into four types of ecological units: a free-flowing reach upstream of the reservoirs, the reservoirs, remnant floodplains between the reservoirs, and a channelized reach below the most downstream reservoir (NRC 2002). The Labadie Power Plant is located in this channelized reach of the lower river. Downstream of the lowermost dam, Gavins Point, there is an unchannelized reach extending 77 miles to just upstream of Sioux City, Iowa. The channelized reach then begins and runs 735 miles to St. Louis, or about one-third of the total length of the Missouri River. It originated as the USACE's Downstream Navigation and Bank Stabilization Project, completed in 1981. The river in this section has been straightened, deepened and narrowed by the construction of revetments and dikes, and by dredging to maintain a navigation channel that is at least 9 feet deep and 300 feet wide.

Flow in the river is regulated, as authorized by the Flood Control Act of 1944, according to the Missouri River Main Stem Reservoir System Regulation Manual (better known as the Master Manual). The Master Manual is supplemented by an Annual Operating Plan, and is interpreted and administered by the Reservoir Control Center of the USACE Northwest Division in Omaha, Nebraska. A revision of the Master Manual was begun in 1979 and was not completed until this past year, 2004 (USACE 2004a). The revision process was influenced by a severe drought extending from 1988 to 1992, which mobilized the attention

of multiple river use stakeholders with interests in upstream recreation, protection of threatened and endangered species (least tern, piping plover, and pallid sturgeon), other valuable natural and historical/cultural resources, downstream navigation, irrigation, and other vital water uses including cooling water for steam generating power plants. Revisions to the Master Manual were completed under the National Environmental Protection Act and involved preparation of an Environmental Impact Statement and consultation with the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act.

The typical annual flow cycle in the regulated Missouri River involves peak reservoir storage in July, followed by a gradual decline in storage until late winter (USACE 2004a). There are two natural peak river flows: one in late February to April created by snowmelt and rainfall in the plains and a second one in May to July created by snowmelt and rainfall in the mountains. River flow in the channelized reach is further supplemented and modulated by tributary inflow. Under the water control plan prior to the 2004 Master Manual revisions, the river flow has been maintained at or above approximately 25,000 to 35,000 cfs during the April 1-December 1 navigation season, then is lowered to 10,000 to 24,000 cfs from December through March to control damage caused by ice dams and flooding (USACE 2004a). Flow releases are adjusted according to short-term and annual rainfall amounts and resulting water storage.

## **2.2 INTAKE DESIGN AND OPERATION**

The Labadie Power Plant consists of four coal-fired generating units with a gross capacity of 2300 MW for the combined units. The dates when service began at each unit were May 1970 for Unit 1, April 1971 for Unit 2, July 1972 for Unit 3, and June 1973 for Unit 4. The plant is operated as a baseload facility and uses once-through cooling. The plant's intake has eight circulating pumps (two per unit), each rated at 107,000 gpm at a 61-foot head (Alden 2004).

The plant's cooling water intake structure is located along the shoreline and consists of one cell for each unit. Within each cell are two bays. Within each bay there is a 10-foot wide vertical conventional traveling screen, for a total of eight traveling screens for the entire intake. There is a 10-foot wide by 9-foot high upper opening and a 9-foot wide by 7-foot high lower opening to each bay. At the mouth of the openings there are steel trash racks made of bars with 2.5-inch clear spacing. The intake does not have a mechanical rake to clear debris from the trash racks. Instead, debris is cleared by alternately operating the circulating pumps to allow debris to dislodge and wash down river.

The traveling screens have ½-inch woven wire mesh and are operated once per 8-hour shift for 1.25 revolutions at 5 fpm. If a 6-inch head differential occurs, the screens automatically will rotate at 20 fpm until the head differential is reduced to 4 inches, after which the rotation speed is reduced to 5 fpm. Debris and fish on the screens are removed by front and rear-mounted spray washes at 100 psi, and are collected in screenwash troughs located in front of and behind the screens. The screenwash troughs lead to an inclined pipe discharging to the river at the downstream end of the intake structure.

The plant's heated waste water is discharged through an 8-foot diameter pipe leading to a seal well, where the water flows over a weir and into a discharge canal located downstream from the intake structure. A warming line can be used to recirculate heated water to the intake to prevent ice buildup in the winter.

## 2.3 HISTORICAL DATA

Union Electric Company (UEC) conducted fish impingement monitoring and limited river sampling at Labadie during 1974-1975 (EEH 1976, UEC 1977). Biomonitoring studies in the river in the vicinity of the plant continued during 1980-1985 and 1995 to the present (UEC 1988; Ameren 1998, 2002). Studies of the fish community in the lower Missouri River also have been conducted in recent years by others, especially with regard to impacts from and mitigation for habitat modifications associated with construction of the Downstream Navigation and Bank Stabilization Project (see Section 2.1). All of these studies can contribute to an understanding of the health of the fish community in the river and a projection of the levels of fish impingement that might presently be occurring at the power plant. The following is a brief description of the nature of these studies and the data available from them.

### 2.3.1 Impingement Studies

UEC (now Ameren UE) conducted impingement monitoring at Labadie from August 8, 1974 through July 10, 1975 (EEH 1976, UEC 1977). Impingement occurring during a continuous 24-hour period was monitored twice per month (usually biweekly), conditions permitting. Impinged fish were collected on removable screens that were emptied and cleaned at the end of the 24-hour period. The fish were removed and identified to species (when possible), counted, measured for length, and weighed.

Fish collected during the 1974-1975 impingement monitoring included 19 taxa identified to species and three identified only to genus (Table 2-1). The collections were dominated numerically by gizzard shad, which accounted for 81.2 percent of the 2,117 collected fish, and by freshwater drum, which represented 13.7 percent of the total. When these collections were extrapolated using fish densities in the samples and the ratio of monthly sampled volumes to total monthly cooling water volume, the estimated total number of fish impinged was 20,867 (Table 2-2). Of this annual total, 80.7 percent were gizzard shad and 12.9 percent were freshwater drum. The remaining taxa comprised only 6.4 percent of the annual impingement. Altogether, nine fish families were represented in the impingement collections (Table 2-1).

Gizzard shad impingement occurred in nearly every month, but was greatest in August and the cold weather months, December through April (Table 2-2). Freshwater drum were impinged in every month but June, but impingement was greater during warm months (i.e., May, August and September) than cold months. Other species were impinged at relatively uniform, low rates during the year.

### 2.3.2 UEC/Ameren River Sampling

Concurrent with their impingement monitoring program, UEC conducted limited sampling of the Missouri River adult fish community in the vicinity of the Labadie intake and discharge canal (UEC 1976). Four types of sampling gear were employed: electrofishing, gill nets, hoop nets, and seines. A 230-volt boat-mounted electrofisher was used to collect 15-minute samples at the shoreline upstream and downstream of the intake, the discharge canal, and the thermal plume at the mouth of the discharge canal. Gill nets were set in the discharge canal and were 125 feet long, consisting of five 25-foot panels of mesh size ranging from 0.75 to 2-inch square. Hoop nets also were set in the discharge canal and consisted of six hoops and 1-inch square mesh. Twenty-foot or 50-foot long seines with 0.25-inch mesh were deployed along the shoreline at the same sampling locations as used for electrofishing.

Electrofishing was conducted once per month in August 1974, October-December 1974 and April-June 1975. Gill nets and hoop nets were set twice in October 1974 and once per month in November-December 1974 and January-June 1975. Seining occurred once in October 1974 and in December 1974.

River sampling caught nine species not found in the impingement samples at Labadie. The nine species and corresponding families are as follows:

Family	Common Name	Scientific Name
Gars-Lepidosteidae	Shortnose gar	<i>Lepisosteus platostomus</i>
Mooneyes-Hiodontidae	Goldeye	<i>Hiodon alosoides</i>
Herrings-Clupeidae	Skipjack herring	<i>Alosa chrysochloris</i>
Minnows-Cyprinidae	Red shiner	<i>Cyprinella lutrensis</i>
	Emerald shiner	<i>Notropis atherinoides</i>
	Golden shiner	<i>Notemigonus crysoleucas</i>
	Rosyface shiner	<i>Notropis rubescens</i>
Bullhead catfishes-Ictaluridae	Blue catfish	<i>Ictalurus furcatus</i>
Sunfishes-Centrarchidae	Green sunfish	<i>Lepomis cyanellus</i>

As with impingement, the most abundant species caught was the gizzard shad. Other relatively abundant species included goldeye, shortnose gar, common carp, red shiner, and emerald shiner.

Biomonitoring studies were conducted during 1980-1985 and 1995-2001 to establish a long-term database on the fish community in the river near Labadie in order to detect possible changes associated with plant operation or other factors, including river channelization or low flows during the drought of 1988-1992 (UEC 1988; Ameren 1998, 2002). From 1980 through 2001 a total of 39 quarterly, seasonal surveys were completed. The surveys consisted of boat electrofishing at five shoreline sites: one immediately upstream from the plant, one in the discharge canal, and three downstream within a distance of approximately 2 miles of the plant. Community and individual fish parameters studied included species composition, species diversity, species assemblage persistence, relative abundance (catch-per-unit-effort), fish size and condition, Pflieger faunal composition characterization, and individual fish movements through tag recaptures. A total of 42 fish species and one hybrid taxon (white bass x striped bass) were identified during the 12 years of these surveys (Table 2-3).

### 2.3.3 Other Fish Community Studies

The most comprehensive recent study of the Missouri River fish community is known as the Benthic Fishes Study (Berry and Young 2001). It was conducted during 1995-1999 by a consortium consisting of the USGS Cooperative Fishery Units in six states along the Missouri River (Idaho, Montana, South Dakota, Kansas, Iowa, and Missouri), the Columbia Environmental Research Center, and the Montana Department of Fish, Wildlife and Parks. This extensive and multifaceted study produced 12 volumes of reports and six doctoral dissertations. Information on the study presently is available on the following website: [http://www.nwo.usace.army.mil/html/pd-e/benthic\\_fish.htm](http://www.nwo.usace.army.mil/html/pd-e/benthic_fish.htm).

While the Benthic Fishes Study features detailed data on distribution, abundance, growth, mortality, recruitment, condition, and population size structure for 26 target benthic species, it also provides some information on other fish species captured during the four-year field

investigations. The study area included the mainstem river from its source to its mouth at the Mississippi River, but excluded the mainstem reservoirs. The study divided the riverine portions of the Missouri River into three zones: the upper Missouri and Lower Yellowstone rivers in Montana; the inter-reservoir riverine segments downstream of the dams in Montana, North Dakota, and South Dakota; and the channelized zone from Sioux City, Iowa to the confluence with the Mississippi River at St. Louis. The study zones were divided into a total of 27 segments, the last of which (Segment 27) includes the final 50 river miles of the channelized zone, beginning 7 miles downstream from Labadie. Standardized sampling gear and methods were used throughout the study. Sampling gear included a 2-m trawl, 5-mm mesh seines, pulsed-DC boat electrofishers, variable mesh (1.8 to 7.5-cm mesh) gill nets, and 1.8-m X 25-m trammel nets with 2.5-cm mesh (Berry and Young 2001). Sampling occurred from July through September in each of the four sampling years, 1995-1999.

Other studies have been conducted on the Missouri portions of the river by the Missouri Department of Conservation (MDC), USFWS, and the University of Missouri, as listed by Berry and Young (2001) and synthesized by Hess et al. (1989). Much of this information has been incorporated into documents prepared for the Master Manual FEIS (USACE 2004a). There are recent published papers and reports specializing on topics such as the larval fish community in the lower river and its tributaries (Brown and Coon 1994, Braaten and Guy 1999), the use of scour basins by larval fish (Galat et al. 2004), shallow water habitat available at modified dike structures (Jacobson et al. 2004a), and the physical habitat in side-channel chutes (Jacobson et al. 2004b) in the lower Missouri River.

#### **2.3.4 Sufficiency of Existing Information for IM Characterization Study**

As described in Section 1.2, the IM Characterization Study requires biological data on the following:

1. Identification of fish and shellfish life stages and species in the vicinity of the CWIS and susceptible to impingement;
2. Their abundance and spatial/temporal distribution, sufficient to characterize the annual, seasonal and diel variations in impingement mortality; and
3. Documentation of current impingement mortality of these species and life stages.

As demonstrated above, there is an extensive amount of information available on the fish community of the Missouri River in the vicinity of the Labadie Power Plant that might satisfy the first two requirements. In terms of the river's fish community and its relationship to impingement at Labadie (the first two items above), sustained trends in annual abundance could cause some species or life stages to become more or less abundant in the vicinity of the Labadie's CWIS, and thus more or less susceptible to impingement. Habitat modifications resulting from the channelization of the lower Missouri River and from flow regulation continue to affect the abundance and composition of the fish community in the lower river. It is also possible that recently introduced species (Rasmussen et al. 2004), such as the grass carp, bighead carp, silver carp, and zebra mussel are affecting impingement totals or displacing the species that were impinged in the past.

The third item listed above as information required for the IM Characterization Study, i.e., documentation of current impingement mortality, would not be satisfied by using available data. Impingement monitoring has not been conducted for 30 years. Therefore, an impingement monitoring program is proposed to document the annual, seasonal and daily

impingement rates that reflect the current status of the fish community and the current intake operation.

The remaining sections of this sampling plan are devoted to describing the fish community for the purpose of a preliminary selection of representative species, and to outlining a recommended sampling scope for monitoring impingement at Labadie.

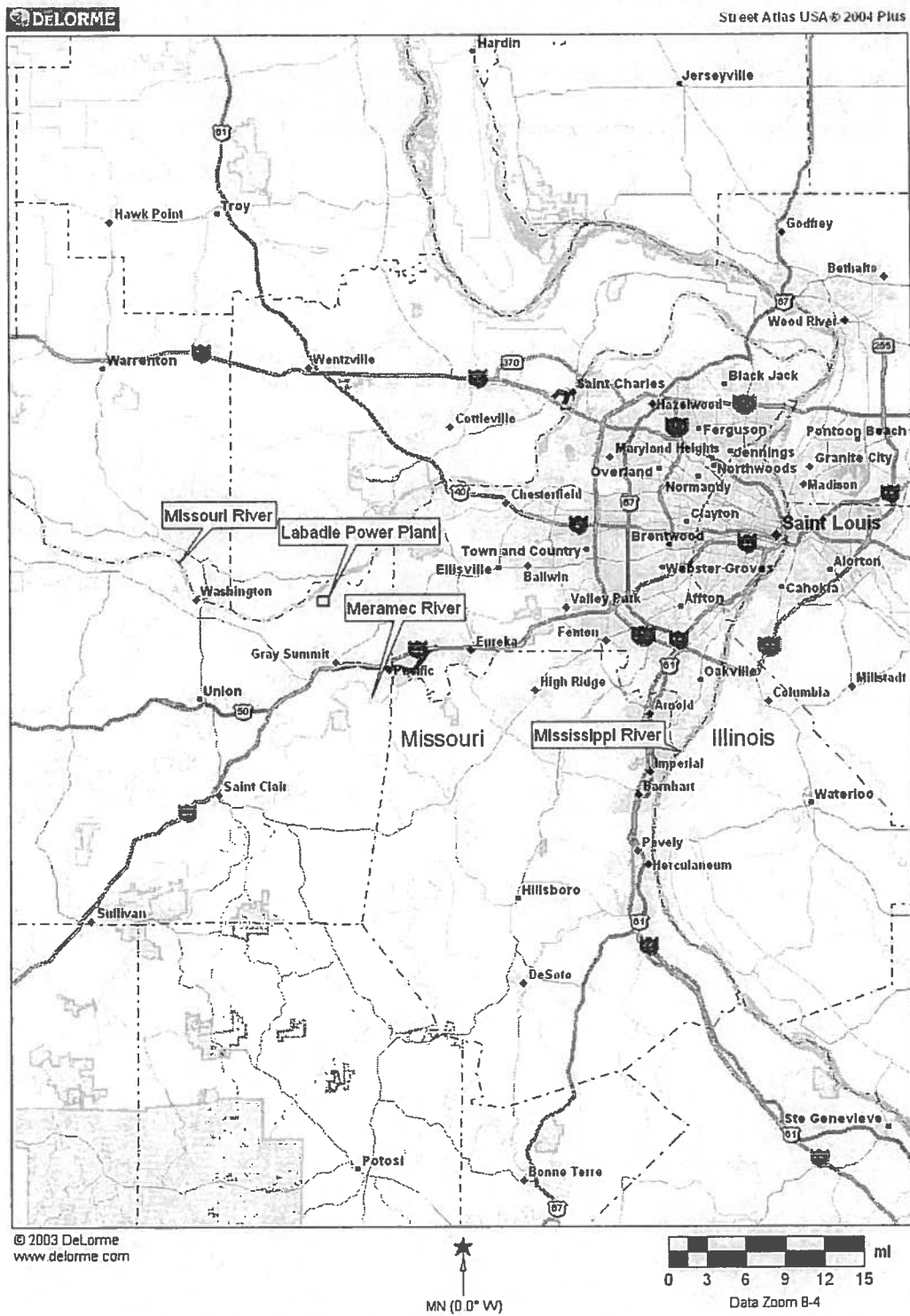


Figure 2-1 Location of the Labadie Power Plant

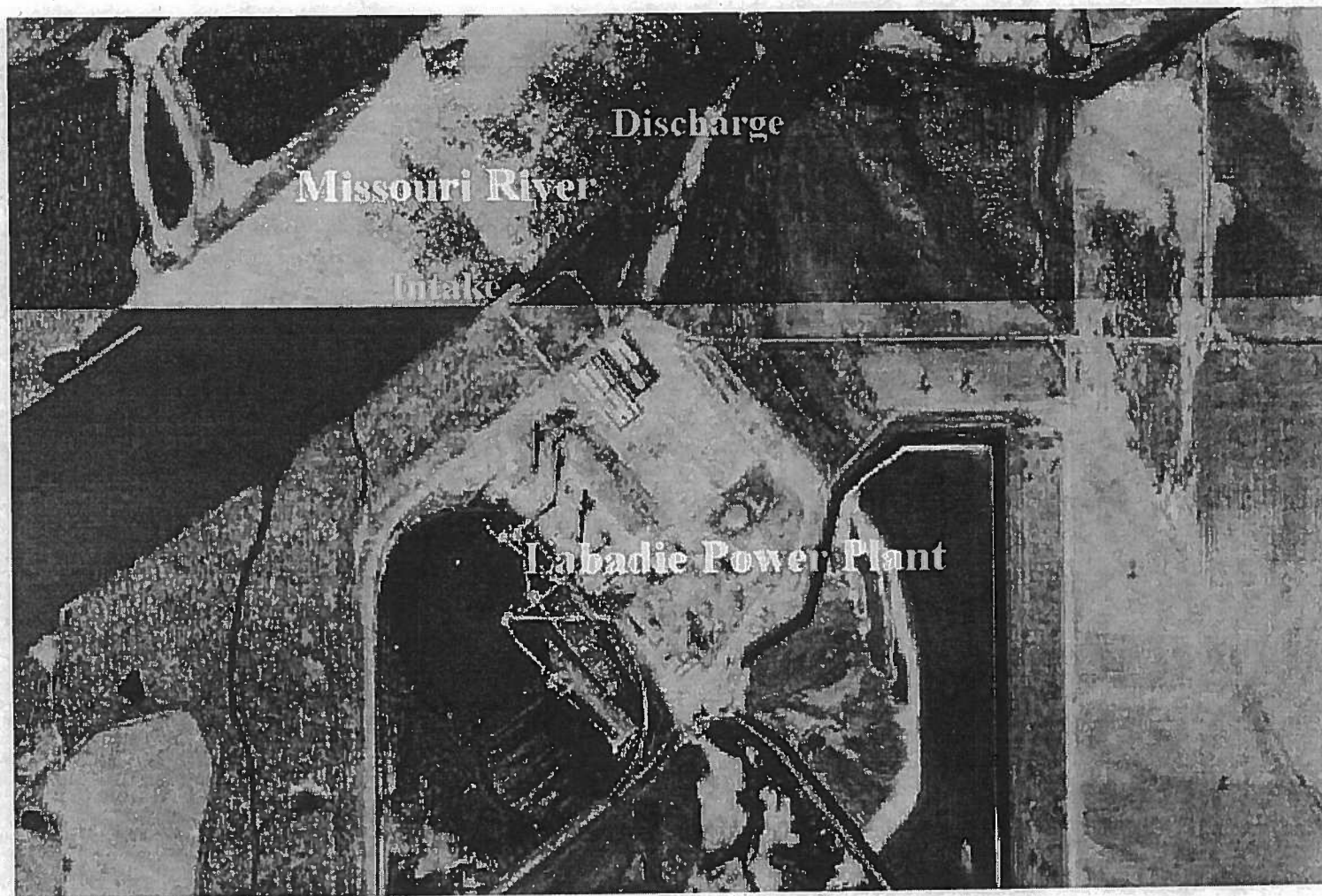


Figure 2-2 Aerial overview of the Labadie power plant.

**Table 2-1 Fish Species Collected in Impingement Monitoring at the Labadie Power Plant, August 8, 1974 through July 10, 1975**

Family	Common Name	Scientific Name	Number Collected	Relative Abundance (%)*
Lampreys-Petromyzontidae	Chestnut lamprey	<i>Ichthyomyzon castaneus</i>	11	0.5
Gars-Lepidosteidae	Longnose gar	<i>Lepisosteus osseus</i>	1	<0.1
Herrings-Clupeidae	Gizzard shad	<i>Dorosoma cepedianum</i>	1,719	81.2
Carps and Minnows-Cyprinidae	Common carp	<i>Cyprinus carpio</i>	4	0.2
	Mimic shiner	<i>Notropis volucellus</i>	1	<0.1
	Minnow	Cyprinidae	2	0.1
Suckers-Catostomidae	River carpsucker	<i>Carpoides carpio</i>	2	0.1
	Northern redhorse	<i>Moxostoma erythrurum</i>	2	0.1
Bullhead, catfishes-Ictaluridae	Blue catfish	<i>Ictalurus furcatus</i>	15	0.7
	Black bullhead	<i>Ameiurus melas</i>	4	0.2
	Channel catfish	<i>Ictalurus punctatus</i>	14	0.7
	Catfish	<i>Ictalurus sp.</i>	9	0.4
	Bullhead	<i>Ameiurus sp.</i>	1	<0.1
	Stonecat	<i>Noturus flavus</i>	1	<0.1
Temperate Basses-Percichthyidae	Flathead catfish	<i>Pylodictis olivaris</i>	21	1.0
	White bass	<i>Morone chrysops</i>	3	0.1
	Striped bass	<i>Morone saxatilis</i>	2	0.1
Sunfishes-Centrarchidae	Bass	<i>Micropterus sp.</i>	1	<0.1
	Bluegill	<i>Lepomis macrochirus</i>	7	0.3
	White crappie	<i>Pomoxis annularis</i>	5	0.2
	Rock bass	<i>Ambloplitis rupestris</i>	3	0.1
Drums-Scianidae	Freshwater drum	<i>Aplodinotus grunniens</i>	289	13.7
TOTAL			2,117	

Table 2-2 Estimated Monthly Impingement Totals for Labadie Power Plant, 1974-1975

Month	Gizzard Shad		Freshwater Drum		Other Species		All Species	
	Numbers	% of Total	Numbers	% of Total	Numbers	% of Total	Numbers	% of Total
August-74	2,534	69.3	858	23.4	267	7.3	3,659	100
September-74	1,144	54.8	709	33.9	236	11.3	2,089	100
October-74	9	50.0	9	50.0	0	0.0	18	100
November-74	178	59.3	100	33.3	22	7.3	300	100
December-74	1,961	97.6	24	1.2	24	1.2	2,009	100
January-75	2,418	94.6	28	1.1	110	4.3	2,556	100
February-75	4,648	98.5	19	0.4	51	1.1	4,718	100
March-75	1,023	84.1	94	7.7	100	8.2	1,217	100
April-75	2,748	88.7	112	3.6	238	7.7	3,098	100
May-75	129	12.5	717	69.3	188	18.2	1,034	100
June-75	0	0.0	0	0.0	13	100.0	13	100
July-75	52	33.3	26	16.7	78	50.0	156	100
Total	16,844	80.7	2,696	12.9	1,327	6.4	20,867	100

**Table 2-3 Total Catch of Fish by Electrofishing during Labadie Biomonitoring Studies, 1980-2001**  
(from Ameren 2002)

Common Name	Scientific Name	Number Caught	% of Total
gizzard shad	<i>Dorosoma cepedianum</i>	3782	54.61
common carp	<i>Cyprinus carpio</i>	565	8.16
freshwater drum	<i>Aplodinotus grunniens</i>	445	6.43
river carpsucker	<i>Carpoides carpio</i>	440	6.35
goldeye	<i>Hiodon alosoides</i>	261	3.77
shortnose gar	<i>Lepistosteus platostomus</i>	235	3.39
channel catfish	<i>Ictalurus punctatus</i>	231	3.34
blue catfish	<i>Ictalurus furcatus</i>	177	2.56
flathead catfish	<i>Pylodictis olivaris</i>	156	2.25
smallmouth buffalo	<i>Ictiobus bubalus</i>	133	1.92
white bass	<i>Morone chrysops</i>	111	1.60
longnose gar	<i>Lepistosteus osseus</i>	76	1.10
chestnut lamprey	<i>Ichthyomyzon castaneus</i>	55	0.79
bigmouth buffalo	<i>Ictiobus cyprinellus</i>	24	0.35
white/striped bass hybrid	<i>M. chrysops</i> x <i>M. saxatilis</i>	24	0.35
white crappie	<i>Pomoxis annularis</i>	19	0.27
bluegill	<i>Lepomis macrochirus</i>	16	0.23
brook silverside	<i>Labidesthes sicculus</i>	15	0.22
blue sucker	<i>Cycleptus elongatus</i>	13	0.19
black crappie	<i>Pomoxis nigromaculatus</i>	11	0.16
mooneye	<i>Hiodon tergisus</i>	10	0.14
skipjack herring	<i>Alosa chrysochloris</i>	10	0.14
black buffalo	<i>Ictiobus niger</i>	9	0.13
grass carp	<i>Ctenopharyngodon idella</i>	9	0.13
largemouth bass	<i>Micropterus salmoides</i>	9	0.13
quillback	<i>Carpoides cyprinus</i>	9	0.13
sauger	<i>Sander canadense</i>	9	0.13
bighead carp	<i>Hypophthalmichthys nobilis</i>	8	0.12
shorthead redhorse	<i>Moxostoma macrolepidotum</i>	8	0.12
American eel	<i>Anguilla rostrata</i>	7	0.10

Table 2-3 Continued

silver carp	<i>Hypophthalmichthys molitrix</i>	7	0.10
spotted bass	<i>Micropterus punctulatus</i>	6	0.09
golden redhorse	<i>Moxostoma erythrurum</i>	5	0.07
walleye	<i>Sander vitreum</i>	5	0.07
white sucker	<i>Catostomus commersoni</i>	4	0.06
green sunfish	<i>Lepomis cyanellus</i>	3	0.04
longear sunfish	<i>Lepomis megalotis</i>	3	0.04
paddlefish	<i>Polyodon spathula</i>	3	0.04
shovelnose sturgeon	<i>Scaphirhynchus platyrhynchus</i>	3	0.04
smallmouth bass	<i>Micropterus dolomieu</i>	3	0.04
striped bass	<i>Morone saxatilis</i>	3	0.04
red shiner	<i>Notropis lutrensis</i>	2	0.03
rock bass	<i>Ambloplites rupestris</i>	1	0.01
Total		6925	

### 3. FISH AND SHELLFISH COMMUNITY

This section describes the aquatic habitat and the fish community in the vicinity of the Labadie Power Plant. A preliminary list of Representative Species for detailed study is then recommended on the basis of their abundance in previous impingement collections or importance due to their economic value, ecosystem role, or protected status.

#### 3.1 AQUATIC HABITAT

The Missouri River has changed dramatically over the past century as the result of man's efforts to manage the river for navigation and flood control. Man's modifications to the river and its floodplain began in the late 1800s simply with removal of snags to permit navigation (NRC 2002). Channel enhancements began in the early 1900s, and damming and flow regulation began in the 1930s. The river modifications culminated in the construction of the five USACE dams on the upper mainstem of the river in the 1950s and 1960s and the completion of the Missouri River Bank Stabilization and Navigation Project in the lower, unimpounded river in 1981. The middle and lower Missouri River have been modified by channelization and shoreline stabilization, which have greatly reduced the amount of natural habitat, thus reducing the abundance of native species and affecting the composition of the fish community. The geomorphology of the river originally was the product of highly variable daily and seasonal flow rates which carried sediments from the highly erodible soils typical of the Missouri River Basin. The result was a complex, meandering river basin and flood plain that was continually shifting but nevertheless in dynamic equilibrium.

River features and processes have been altered by the navigation and flood control projects (NRC 2002). Lost are the flood pulses in the spring and early summer that influenced the river morphology, connected side channels and backwaters to the main channel, created new and productive habitats, cycled organic material and nutrients between the channel and floodplain, replenished water in the floodplain, and served as cues for spawning of fish and other organisms. River meanders were straightened, natural riparian vegetation was lost, variations in river flows and water temperatures were reduced, periodic overbank flow to the floodplains and its nutrient cycling benefits were eliminated or reduced, sediment transport was reduced, and natural processes of cut and fill alleviation were modified. It has been estimated that approximately 3 million acres of riverine and floodplain area have been lost as the result of channel straightening and levee construction (NRC 2002).

Today the middle and lower Missouri River is a channelized river that is 600 to 1100 feet wide and requires periodic dredging for navigation. The channel is narrower and more uniform than its previous form, with a trapezoidal cross-section resulting in steeper embankments and faster currents. Productive side channels, chutes, sand bars, islands and backwaters are much reduced. To mitigate for the losses resulting from the Missouri River Bank Stabilization and Navigation Project, the USACE, under the authority of the Water Resources Development Act of 1986, as amended by the Water Resources Development Act of 1999, has instituted the Missouri River Fish and Wildlife Mitigation Project, Iowa, Nebraska, Kansas, and Missouri. This project is being conducted with the participation of federal and state resource agencies acting as the Agency Coordination Team (USACE 2004b). The Missouri River Fish and Wildlife Mitigation Project is authorized to acquire and/or restore a total of 166,750 acres of land within the four involved states. In addition to land acquisition and protection, the various mitigation measures being adopted include levee relocation or breaching, river structure modifications, flow enhancement in

side channels and chutes, dike notching for shallow water habitat enhancement, and creation of backwater areas and wetlands (USACE 2004b; Jacobson et al. 2004a,b).

Due to the lack of an integrated water quality monitoring program for the river, there is only limited information that can be used to evaluate temporal trends in water quality since dam construction and channelization of the middle and lower river, except for individual federal and state agency reports. Causes of water quality degradation include sediment, nutrient, and pesticide runoff from agriculture; sediment and metal loadings from mines; urban stormwater discharges; wastewater and industrial plant discharges; septic system leaching; and entrapment of sediments and pollutants behind dams. The Missouri River from its mouth at St. Louis to the Gasconade River has designated use support for warmwater fishery, drinking water, recreation, agriculture, industrial, and livestock and wildlife watering (USACE 2004a). This lowermost section of the river is included in Missouri's §303(d) list of impaired waterbodies due to moderate impairment from habitat loss caused by channelization. In the channelized reach there is also a gradual downstream degradation due to point and nonpoint sources and tributary inflows, particularly in terms of nutrient concentrations, e.g., organic nitrogen, nitrate, total phosphorus, and ortho-phosphorus. The dissolved oxygen (DO) concentration standard is 5 mg/l and DO is typically below saturation levels. Once an extremely turbid river, the Missouri River turbidity levels decreased four-fold (from 1200-2600 to 200-400 JTU) between 1930 and 1983 due to dam construction (Berry and Young 2001).

At the Labadie Power Plant, the south bank of the river is reinforced with rip-rap and revetments, and the river bottom drops sharply because the channel closely approaches the south bank in this area. On the north bank and downstream from the plant on the south bank there are rock pile dikes extending into the river. Sandy beaches become exposed at low water levels. The river currents past the plant are swift, with velocities estimated between 2.6 and 4.8 fps. There is no rooted vegetation. The river stage in this area can fluctuate as much as 11 feet (UEC 1977). Due to the swift currents and turbulence, the vertical thermal profile is uniform. Water temperatures will range from 32 °F to 88 °F seasonally.

### 3.2 COMMUNITY COMPOSITION

A total of 156 fish species have been identified as occurring in the Missouri River Basin, of which approximately 100 regularly inhabit the river downstream of the impoundments (Berry and Young 2001). Included are at least 18 introduced or exotic species. The most common species in the channelized river include the emerald shiner, river carpsucker, channel catfish, gizzard shad, red shiner, shorthead redhorse (*Moxostoma macrolepidotum*), common carp, freshwater drum, shortnose gar, and goldeye (USACE 2004a). All but the shorthead redhorse were found during sampling at Labadie (Section 2.3). The most important sportfish species include the sauger (*Sander canadensis*), white bass, and channel catfish. Commercially exploited species have included the channel catfish, bigmouth buffalo (*Ictiobus cyprinellus*), smallmouth buffalo (*I. bubalus*), flathead catfish, goldeye, and members of the sucker family, Catostomidae.

Most of the native species of the mainstem river are now rare, uncommon, or decreasing in abundance across part or all of their previous range due to the changing ecosystem and habitat losses during recent decades (NRC 2002). Berry and Young (2001) estimate that approximately 35 native species are declining in abundance while 23 species are increasing. In many river reaches, the abundance of non-native species has become greater than that of native species because of their greater tolerance for the altered

temperature regime, flow, turbidity and habitats. Some of the species most affected include the pallid sturgeon (*Scaphirhynchus albus*), plains minnow (*Hybognathus placitus*), sauger, sturgeon chub (*Macrhybopsis gelida*), and sicklefin chub (*M. meeki*) (NRC 2002, USACE 2004). Present river conditions favor sight feeders (e.g., skipjack herring, white bass, mimic shiner, and spotfin shiner) over native species that have adapted to higher turbidity levels (Berry and Young 2001).

At some point in their life history, most of the native species are dependent upon the few remaining areas containing shallow, low velocity habitat as occurs in side channels and backwaters. These species have been affected by the loss of flood pulses, channelization, and reduced sediment loading. To some degree, the flood events of 1993 and 1995 have helped to restore some of the lost habitat, e.g., by creating scour lakes in the floodplain. Several native species require shallow areas with fast currents that are now primarily found only in the unchannelized portions of the river. These species include the shovelnose sturgeon (*Scaphirhynchus platyrhynchus*), sturgeon chub, sicklefin chub, blue sucker, and stonecat. In the channelized reach, most fish species will be associated with structures such as dikes and revetments. However, the greatest numbers and diversity will be found in side channels, of which few remain. Tributaries can serve as a refuge or as important spawning locations for many species, such as river carpsucker, goldeye, sauger, common carp, shortnose gar, freshwater drum, channel catfish, gizzard shad, white crappie, and smallmouth buffalo (Brown and Coon 1994, Braaten and Guy 1999).

Some information on temporal trends in abundance is available for the fish species of the channelized reach and specifically in the vicinity of the Labadie Power Plant. Over-harvest was responsible for the decline of walleye, sauger, crappies, sunfishes, and largemouth bass in the early 1900s, prompting closure of the commercial fishery for these species (Berry and Young 2001). Records from 1945 to 1963 indicated a declining catch of catfishes, buffaloes, common carp, sturgeons, paddlefish, and freshwater drum. Pflieger and Grace (1987, in Berry and Young 2001) reviewed changes in the lower Missouri River from 1940 to 1983 and reported 67 species as being present, with increases in pelagic planktivores and exotics (e.g., rainbow smelt, grass carp, silver carp, and striped bass).

From its biomonitoring studies in the vicinity of Labadie, Ameren (2002) concluded that the fish community since 1980 has been persistent and stable, with indications of possible increases in certain species, such as bigmouth buffalo, smallmouth buffalo, channel catfish, blue catfish, common carp, river carpsucker, and possibly blue sucker. Most of these species are or have been commercially exploited. Commercial fishing for flathead catfish and channel catfish was prohibited in the early 1980s due to a decline in the number of large fish (Berry and Young 2001). A reduction in commercial fishing may be at least partially responsible for an overall increase in commercially exploited species; the number of licenses decreased from over 1000 in 1982 to approximately 100 in 1996 (Robinson 1998 in Ameren 2002).

### **3.2.1 Protected Species**

There are several protected fish species in lower Missouri River that are currently listed (<http://mdc.mo.gov/cgi-bin/echecklist/search.cgi?TYPE=FISH>) by the state of Missouri but no protected species were found in the impingement collections at Labadie. There is only one federally listed species, the pallid sturgeon. State-listed species include the flathead chub (*Platygobio gracilis*), sicklefin chub, silver chub (*Macrhybopsis storeriana*), paddlefish, and mooneye. Of this group, only the flathead chub is listed by the state as endangered, with a state rank of S1, i.e., "critically imperiled in the state because of extreme rarity or

because of some factor(s) making it especially vulnerable to extirpation from the state." The flathead chub's global ranking is G5, signifying that it is "demonstrably widespread, abundant, and secure globally, though it may be quite rare in parts of its range, especially at the periphery." A status assessment is currently underway by the USFWS regarding a possible federal listing of the species. The flathead chub is a species adapted to turbid waters where the current is swift. Possible reasons for its decline are nonpoint source pollution, mainstem impoundments impacting flow regimes, and degradation of riparian areas.

The other four state-listed are species of concern with the state rank of S3 or "rare and uncommon in the state" and a global ranking of G3 (sicklefin chub), G4 (paddlefish) or G5 (silver chub, and mooneye)<sup>1</sup>. Several environmental organizations petitioned the USFWS to list the sicklefin chub, along with the sturgeon chub, as endangered species. In April 2001, the USFWS announced its finding that these species do not warrant listing as being endangered or threatened, stating that "while the historic range of the sicklefin and sturgeon chub has been reduced, we have concluded that stable, self-sustaining populations remain widely distributed throughout their range."

### 3.2.2 Exotic Species Introductions

As discussed in Section 3.2, there are several non-indigenous fish species in the lower Missouri River that have become important constituents of the fish community, including the commercially exploited common carp and the white bass. However, none has been as potentially destructive as the recently introduced asian carp species, including the grass carp or white amur (*Ctenopharyngodon idella*), bighead carp (*Hypophthalmichthys nobilis*) and silver carp (*Hypophthalmichthys molitrix*). These three species are becoming well established and threaten to disrupt the trophic dynamics of the Missouri River ecosystem. The bighead carp and silver carp also have become a nuisance, or even a hazard, to the commercial and recreational fisheries of the river due to their large size and propensity to either interfere with the retrieval of commercial fishing gear, or in the case of the silver carp, to jump several feet out of the water when frightened by boat motors, occasionally striking boaters in the process. All have been introduced to the ecosystem either intentionally through stocking interconnecting waterways or accidentally through escapement from captivity.

The grass carp is an herbivore imported from eastern Asia and intentionally stocked to control aquatic macrophyte growth in Arkansas and elsewhere (Rasmussen et al. 2004). Grass carp exhibit rapid growth and can attain lengths up to 63 inches and weights up to 81 pounds. Potential negative effects on the fish community are interspecific food competition with invertebrates and native fishes, interference with reproduction of other species, decreased refugia or modification of preferred habitat for other fishes, and introduction of nonnative parasites or diseases (Rasmussen et al. 2004).

Bighead carp is a large species native to large rivers in eastern China. It began to appear in the Mississippi River in the early 1980's (Rasmussen et al. 2004). The bighead carp has a

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<sup>1</sup> G3 means that it is "either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range...or because of other factors making it vulnerable to extinction throughout its range." G4 means "widespread, abundant, and apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery." G5 means "demonstrably widespread abundant, and secure globally, though it may be quite rare in parts of its range, especially at the periphery."

laterally compressed body and very large head, and can reach lengths of 40 inches and weights of 75-90 pounds. It is adapted to straining planktonic organisms for food, and thus would compete with indigenous planktivores like gizzard shad, paddlefish and bigmouth buffalo, as well as larval fishes and mussels.

Silver carp also is a planktivorous species originating from large rivers in eastern Asia. Its history in the U.S. is largely linked to the bighead carp and its potential impacts on the ecosystem are the same. However, it is a more efficient plankton strainer because its gill rakers are fused into sponge-like porous plates, which allow it to strain small, bacteria-sized particles (Rasmussen et al. 2004). The silver carp is rapidly increasing in abundance and can reproduce in off-channel and backwater areas.

Although these three asian carp species will grow rapidly and thus become less vulnerable to impingement at Labadie, an occasional adult specimen could become impinged as well as smaller juveniles. Their presence in the long term could affect the species composition and distribution of the fish community.

### **3.3 REPRESENTATIVE SPECIES**

Representative Species (RS) typically would be those most frequently observed in impingement collections, or most important because of their economic value, value to the ecosystem, or protected status. In addition to being the target species for evaluating compliance with impingement mortality reductions, RS could be used to estimate the economic losses of fish impingement for a cost-benefit analysis under the EPA site-specific compliance alternative #5 or for scaling restoration efforts and verifying the success of restoration alternatives. It would be important to collect length, weight, and age data from RS during the impingement monitoring program in order to estimate individual growth rates and biomass production for species used in the cost-benefit and restoration analyses. Such detailed analyses would not be possible or practical for all species impinged. Therefore, RS would serve as surrogates for other species of less critical importance or abundance.

Impingement at Labadie in the past has been dominated by gizzard shad and freshwater drum. Because of their dominance of impingement numbers and biomass, these two species are recommended as potential RS. Most other species were collected in only limited numbers, with the exception possibly of catfish, including blue catfish, channel catfish, and flathead catfish. Flathead catfish were slightly more abundant in the 1974-1975 impingement collections than were the other two catfish species. Catfish are important commercial or recreational species in the Missouri River and may be good indicators of the potential impacts of impingement on the fisheries of the river and the river's ecosystem.

This section describes the three fish species recommended as potential RS for detailed study: gizzard shad, freshwater drum, and flathead catfish. As impingement monitoring progresses, this list could be modified to better reflect the composition of the impingement collections and the current status of the fish community.

#### **3.3.1 Gizzard Shad**

The gizzard shad is one of the most abundant fish species in Missouri, where it occurs in every stream system but is most abundant in the Mississippi and Missouri Rivers (Pflieger 1997). It is so abundant in some locations that it is sometimes considered a nuisance species, possibly competing with other species for food and space. It is a very important prey species. Its productivity is linked to its role in the trophic structure of the community,

since it feeds on both plants (phytoplankton and periphyton) and animals and is planktivorous. It was by far the most frequently impinged species at Labadie in the 1974-1975 monitoring program, with 1,719 specimens being collected, representing 81 percent of the total collections (Section 2.3.1, Table 2-1). The projected total annual impingement of gizzard shad from August 1974 to July 1975 was 20,867 fish (UEC 1977).

Gizzard shad impingement was greatest in the winter months, and likely was related to a weakened condition at that time. Gizzard shad are known to be subject to natural winter die-offs when water temperatures decline below 11 °C and young gizzard shad cease feeding (White et al. 1986). At these colder temperatures, young gizzard shad must rely on the metabolism of lipid reserves for survival, but prolonged cold temperatures, particularly below 8 °C, can result in liver and brain dysfunction and catabolism of body tissues, leading to disorientation and/or death.

Gizzard shad spawn in early April and May in shallow water in relatively protected areas (Pflieger 1997). The eggs are adhesive and attach to the bottom. Young gizzard shad grow very quickly, reaching 6 to 7 inches by the end of their first year (Benson 1970). This rapid growth rate limits the period when they are effectively preyed upon to approximately their first six months of life, since by September they become too large for all but the largest predators. Gizzard shad mature in their second or third year of life at ages I-II (Pflieger 1997).

In the Missouri River, young gizzard shad are abundant along the shore in late May and June (Pflieger 1997). As adults, they are most frequently found in quiet waters, such as backwaters and pools, where they form large moving schools, often near or at the surface. They feed on algae, plankton and insects by filter-feeding through their gill rakers.

### **3.3.2 Freshwater Drum**

Like the gizzard shad, in the state of Missouri the freshwater drum is most abundant in the Mississippi and Missouri Rivers (Pflieger 1997). It is an important commercial and recreational fish. It was the second-most frequently impinged species during the 1974-1975 monitoring program at Labadie, with 289 specimens collected during sampling (Section 2.3.1, Table 2-1) and a projected total annual impingement of approximately 2,700 fish (UEC 1977). Freshwater drum were impinged in nearly every month, but impingement was greater during warm months (i.e., May, August and September) than cold months.

The freshwater drum spawns in late April and May. Although spawning has not been directly observed, it apparently occurs in shallow, open water and in tributaries to the river (Brown and Coon 1994, Braaten and Guy 1999, LaJeune et al. 2004). Eggs and larvae are buoyant and drift with the river flow. Adult freshwater drum feed by grubbing along the bottom and consuming mollusks, insects, fish and crayfish. They apparently will feed on zebra mussels, the pest species recently introduced to the river system. Freshwater drum are slow growing and long-lived. They can reach up to 20 inches in length and 10 pounds in the region, but most are 1 to 3 pounds in size (LaJeune et al. 2004). Males will mature at ages III-IV and lengths of 11 to 14 inches, while females mature at ages V-VI and 13-15 inches.

The lower Missouri River provides excellent habitat for freshwater drum, where they are abundant in the channel and tributaries. It is relatively tolerant of turbidity. In summer months it can be found in nearly all river areas, but in the winter at water temperatures less

than 50°F, it will avoid strong currents and seek deeper side channels and backwaters (LaJeone et al. 2004)

The buoyancy of its eggs and larvae makes this species more vulnerable to entrainment into water intakes and boat propeller wash. The young are also sensitive to near-freezing temperatures in the main channel and side channels during winter, which can lead to overwinter mortality during severe or prolonged periods of cold temperatures if thermal refugia are not available (LaJeone et al. 2004).

### **3.3.3 Flathead Catfish**

The flathead catfish is a large, predatory riverine catfish species that is actively pursued by commercial fishermen and recreational anglers. It is larger than the channel catfish but smaller than the blue catfish. The flathead catfish is capable of reaching trophy sizes, sometimes exceeding 65 pounds while reaching a state record of 98 pounds in Missouri waters (Brummet and Jones 2004). It was the third-most frequently impinged fish species during 1974-1975 monitoring program at Labadie and the most frequently impinged catfish species, with 21 specimens being collected during sampling (Section 2.3.1, Table 2-1).

Flathead catfish spawn in late June or early July by excavating depressions in the substrate, usually near submerged objects, and laying eggs in a golden-yellow mass. The male parent guards the nest until approximately 1 week post-hatching, when the young leave the nest. Flathead catfish mature at ages IV to V or about 18 inches in length (Brummet and Jones 2004). They may live up to 28 years.

Young flathead catfish inhabit shallow areas, feeding mostly at night. Larger fish occupy deeper water but continue to feed at night on other fish and crayfish. A study conducted in Mississippi River on the flathead catfish indicated that its abundance was related to the amount of mature forested area in the riparian zone and the amount of snags available in the river (Brummet and Jones 2004). Adult flathead catfish usually have a short home range in the river (e.g., <1 mile), but tagging studies have shown a small percentage (15 percent) to travel distances greater than 20 miles. During warm months, adults can be found in all river habitats except backwaters. In the winter, adults become relatively inactive, staying near structures such as boulders and log piles.

## 4. PROPOSED IMPINGEMENT MONITORING

As discussed in Section 2.3.4, impingement data were collected at the Labadie Power Plant during the 1974-1975 impingement monitoring program. This sampling provided useful data on the magnitude of impingement at Labadie during that time period. However, the plant operation and the fish community in the lower Missouri River may have changed sufficiently since then to affect impingement at Labadie, in particular the species composition and magnitude of impingement.

The objective of the proposed impingement monitoring program is to update the existing impingement data to reflect current conditions in the river and current operation of the plant. Data produced by this monitoring program will define the species and life stages impinged, as well as their numbers and biomass on a time (biweekly, monthly, and annual) and per-volume-pumped (million gallons of cooling water) basis. The results will be incorporated into the IM Characterization Study, as described in Section 1.2.

This section addresses the proposed sampling plan, sampling gear and the method for its deployment, sample processing procedures, the collection of relevant ancillary information, and data analysis. A quality assurance program for the impingement monitoring program is described in Section 5.

### 4.1 SAMPLING DESIGN

The impingement monitoring program is recommended to span at least one year (12 months) and to include all four units. A second year of monitoring may not be necessary if the magnitude of impingement and/or the species and life stages impinged do not differ markedly from the results of the 1974-1975 monitoring program, e.g., seasonal or annual impingement totals or rates (average daily or average number per unit volume pumped).

Impingement will be sampled every other week and the traveling screens of all operating units will be sampled at the same time. If no units are scheduled to operate during the specified biweekly sampling period, a request will be made to turn on a circulating water pump for the duration of sampling in order to get representative density measurements. This biweekly sampling frequency will describe seasonal patterns in impingement as requested in the Phase II Rule.

Sampling will occur over one 24-hour period per biweekly period. Sampling days will be scheduled for the same day(s) in each period (e.g., Tuesday).

### 4.2 SAMPLING GEAR AND DEPLOYMENT

Prior to sampling, the traveling screens will be rotated for at least one full cycle to remove fish and debris accumulated prior to the sampling interval. Once this cleaning process has been accomplished, the sampling will be initiated by lowering a collection basket into the screen wash trough system that serves all four units. The screens will be rotated during the sampling period in a manner typical of normal screen operation, i.e., they will be washed with a frequency necessary to keep them clean. The collection basket will have 1/4-inch square mesh. The sampling crew will monitor the screen wash troughs and collection basket to prevent overflow or snags caused by debris buildup. During periods of very low volume of impinged fish and debris, the collection basket may be left in place for the entire 24-hour collection period. When fish and debris volumes become greater, screens from

individual units will be rotated and washed sequentially and as frequently as necessary to reduce the volume of debris and fish being directed to the collection basket at once. At the completion of each sampling, the collection basket will be removed and its contents will be emptied onto a processing table.

If necessary, screen rotation will be continuous at all screens. In this case, the sampling crew will continuously monitor the screen washwater troughs and the collection basket to prevent snags or overflow caused by ice or debris buildup. To prevent collection basket overflow, the crew will temporarily interrupt sampling, empty the collection basket's contents, and resume sampling, while recording the start and end times of the interruption. If this occurs, the total impingement during the 24-hour sampling period will be estimated by extrapolating from the timed subsamples to a full 24-hour sample.

#### **4.3 SAMPLE PROCESSING**

Each sample will be processed by counting and identifying all fish to the lowest practicable taxonomic level. Individual fish that cannot be identified to species in the field will be preserved for identification by taxonomic specialists. Shellfish found in the impingement sample, such as native freshwater mussels, Asiatic clams, zebra or quagga mussels, and crayfish, will be identified to a practicable taxonomic level and will be counted (in the case of few specimens such as native freshwater mussels or crayfish) or weighed in bulk (in the case of numerous Asiatic clams or zebra and quagga mussels).

Fish in the sample will be sorted by species and size category. Two size categories will be established prior to sampling, if possible, to separate young-of-the-year (YOY) individuals from yearling and older individuals. Size categories will be determined according to cut-off lengths used during the previous biweekly sampling period and anticipated growth, based on observation and literature sources. Following sorting, up to 50 randomly chosen individual specimens within each size category will be measured to the nearest mm total length (TL) and their condition will be recorded as live, dead or stunned. A total batch weight measurement will be taken for each size category.

If the number of specimens in the sample for a particular species and size category is large, then the species/size category count will be estimated by subsampling. A subsample of 100 individuals will be weighed and the total sample will be weighed. The number of individuals in the whole sample will be estimated from the ratio of the total sample weight to the subsample weight total and the count within the subsample. Lengths will be measured for 50 randomly chosen individuals in the subsample.

During each season (e.g., April-June, July-September), scales, finrays, spines or otoliths (depending on species) from 20 measured yearling and older individuals of each of the representative fish species from each 50-mm length interval (e.g., 200 – 249 mm, 250 – 299 mm, etc.) will be removed and stored in individual envelopes or vials. For each sampled fish, the collection date and location, species, and total length will be recorded. These samples may be used, if necessary, to supplement recent size-specific age data available from literature sources for species in the middle or lower Missouri River. Size-specific age data may be required for application of equivalent loss models as part of a site-specific cost-benefit calculation.

The general condition of impinged fish will be observed as they are processed. Unusual condition, such as signs of disease, parasites or injury, will be noted. Fish that were obviously dead before being impinged (e.g., presence of fungus or decay) will not be

included in the sample. Indications of a mass die-off of fish, such as can occur with gizzard shad (White et al. 1986), will be observed and recorded, and examples of physical evidence (e.g., floating fish in the river or dead fish on shore) will be photo-documented. If available, scientifically defensible methods to detect or predict the occurrence of moribund fish entering the intake will be used to document episodic impingement events that would represent anomalous impingement data. Samples may be frozen and saved at the completion of processing, for possible inclusion in quality control (QC) testing. Once it is determined that a sample is no longer needed for QC purposes, the sample will be disposed of in an approved manner. QC of sample processing is discussed in Section 5.

#### **4.4 RELEVANT ANCILLARY INFORMATION**

There is ancillary information that must be recorded relevant to environmental conditions at the time of impingement monitoring, as well as plant operation data needed to estimate total impingement. Environmental data relevant to each sample will be recorded on an accompanying field data sheet. In addition to date and sample start/end time recordings, these data will include operation parameters for the intake (identify screens and pumps operating), river stage, and water temperature, all recorded at the beginning and end of each collection period. A unique sample identification number will be assigned to each sample. Other relevant observations will be recorded, including river and weather conditions, such as air temperature, wind speed, cloud cover, and precipitation.

Plant operation records will be used to determine the operation regime during the sampled and unsampled days in each month. Data will include hourly pumping rates (or volumes) for each unit, generation output (MWh) and discharge water temperature. Pumping rate or volume data will allow impingement estimates to be based on per unit volume pumped.

#### **4.5 DATA ANALYSIS**

The objectives of the impingement data analysis will be to:

1. define the fish species impinged;
2. estimate impingement rates expressed as density per million gallons (MG) of cooling water pumped on a daily, biweekly, and annual basis;
3. estimate total numbers and biomass by species on a daily, biweekly (for seasonal variability), and annual basis for the year of sampling; and
4. characterize impinged fish in terms of size and age distribution by species.

These parameters will be compared to the results of impingement sampling from the 1974-1975 monitoring program to determine whether there are differences that would suggest possibly significant annual variability in impingement at Labadie. If annual variability is determined to be of concern, a second year of impingement monitoring may be considered, as deemed necessary by Ameren to support the submittal of the CDS. The results will be incorporated into the IM Characterization Study in the CDS, as discussed in Section 1.2.

The estimated total numbers and biomass impinged will represent the actual impingement for the year of sampling. However, the impingement rates expressed as density per million gallons (MG) of cooling water pumped can be used to estimate impingement totals under differing operating scenarios, such as might be required to determine the calculation baseline for the station. To estimate the density of impinged organisms for a particular

species, the number of fish of that species collected from all screens will be divided by the total intake flow during the 24-hour sampling period. This density estimate then will be multiplied by the total intake flow during the biweekly period to estimate the total number of impinged fish for the biweekly period. Seasonal totals will be calculated by summing the biweekly totals falling within the season. Annual totals will be the sum of all biweekly totals. The same calculations will be performed for estimating total biomass impinged using weight totals. Plant operation records (hourly pumping rates or volumes for each unit) for sampled and unsampled days in each month will be used to perform this extrapolation.

## 5. QUALITY ASSURANCE

An essential part of the proposed monitoring program will be a quality assurance plan instituted to ensure that the data generated by the program meet an acceptable standard of quality. Quality assurance (QA) is defined as an integrated system involving quality planning, quality control, quality assessment, quality reporting, and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence. The EPA has published guidance documents (e.g., EPA 2000, 2002a, 2002b) for preparing and implementing project-specific quality assurance plans for their staff and for contractors funded by their organizations to follow, known as Quality Assurance Project Plans (QAPPs). These documents will be used to prepare a QAPP that fits the needs of the proposed impingement program prior to the initiation of sampling.

A QAPP has four basic element groups: project management, data generation and acquisition, assessment and oversight, and data validation and usability. The following highlights aspects that are particularly relevant to the execution of the proposed impingement monitoring program.

### 5.1 PROGRAM MANAGEMENT

This Impingement Mortality Sampling Plan provides many of the elements necessary for the program management functions of a QAPP, such as problem definition and background, and project and task descriptions. Other program management functions of a QAPP that are provided in the Plan include presentation of the project objectives and the interrelationships among the project tasks that direct the course of studies and identify information endpoints. An important element is the project organization, which identifies the roles and responsibilities of project personnel. A project organization chart identifies project personnel, whose qualifications (e.g., experience and specialized training) can be reviewed, as well as lines of communication and authority. The project organization chart will show individuals whose responsibility is to conduct various aspects of the quality assurance program.

The QAPP will set data quality objectives and criteria. Methods are specified to ensure a desired level of precision, comparability, and completeness. In terms of impingement mortality quantification, the EPA has not set standards for precision of estimates, so the sampling design proposed in this Plan is intended to conform to sampling effort, and hopefully precision levels, that are currently standard practice. If the EPA publishes guidance on sampling methods in the future, including QA standards and desired or required levels of precision, the program design and methodology will address those standards.

### 5.2 DATA GENERATION AND ACQUISITION

This component of the QA program is the heart of the field and laboratory tasks undertaken to collect (generate) data on current impingement mortality at Labadie. Elements include sampling design, sampling methods, sample handling and custody, analytical methods, instrument maintenance and calibration, and quality control. Quality control is defined as activities whose purpose is to measure and control the quality of a procedure so that it meets the needs of its user. Quality control (QC) activities monitor the outgoing quality of the data and can lead to response actions to bring the data within control limits through

various actions, such as retraining of personnel, repair or recalibration of equipment, or other similar actions.

Sampling methods will be standardized so that they are repeatable and produce data that are comparable through time. This will be accomplished by preparing detailed Standard Operating Procedures (SOPs) for all activities, including sampling location and frequency, sampling gear and deployment, sample processing, data coding and recording, database entry, and to some degree, data analysis. The SOPs can be reviewed by all parties to reach consensus on their applicability, and will be adhered to by all project personnel. SOPs will provide a description of procedures to follow if obstacles to sampling or completion of all sampling activities are met, so that the acquisition of quality data can be maximized. The SOPs will describe procedures for sample handling and custody, including required signatures and blank forms for associated labels and logs. Also included will be project-specific data sheets, variable definitions and coding instructions. Equipment and instrument specifications will be described, including levels of precision and calibration methods for ensuring accuracy.

Systematic QC procedures will be instituted to verify recorded data. The primary area where these QC procedures will be used is sample processing, e.g., sorting of impinged fish from debris in the collections, fish counts, species identification, and length and weight measurements. Processed impingement samples will be subjected to a statistically-based QC procedure, such as continuous sampling plans (CSP) or MIL-STD 105 methodology derived from a manufacturing environment and applied to environmental monitoring programs (Young et al. 1992). The sampling plans implemented under these procedures have a specified average outgoing quality limit (AOQL), which represents the maximum fraction of all items (e.g., measurements, taxonomic identifications or counts) or lots (e.g., whole samples) that could be defective as a worst case. A defective item could be a measurement or count that falls outside of a specified tolerance limit (e.g., plus or minus 1 to 10 percent). In practice, the average outgoing quality (AOQ) is typically much better than the AOQL.

### **5.3 ASSESSMENT AND OVERSIGHT**

Assessment and oversight is the process of determining whether the QA plan is being implemented as designed. For the proposed programs, this will be accomplished primarily by conducting technical audits or surveillance of field, laboratory and data management activities (EPA 2000a). Experienced senior staff, designated by the organization chart, will accompany field personnel during a set number of sampling events to observe sampling activities and to verify that SOPs are being followed properly. These auditors also will observe laboratory and data management personnel during their activities on specified occasions. Variances from approved procedures will be documented and corrected, either by modifying SOPs to address any systematic problems or by testing and/or retraining staff, as necessary. Prior to the first scheduled sampling, a readiness review will be conducted to ensure that trained personnel, required equipment, and procedural controls (e.g., SOPs) are in place. A technical audit will be scheduled for the first month of sampling (or very soon thereafter) so that any necessary corrections can be made before significant data losses occur. Follow-up audits will be scheduled (e.g., quarterly) to monitor progress and address changing conditions, such as recruitment of new life stages or species, impingement abundances, river stage or flow, new personnel, or plant operations.

Another QC aspect for oversight is the maintenance of a voucher specimen collection and a library of approved taxonomic keys and references to assist personnel with taxonomic

identification. The voucher specimen collection will consist of preserved specimens that have been positively identified by a qualified taxonomist. Oversight also will be provided by procedures requiring that specimens that are not positively identifiable by field or lab personnel will be preserved and given to a qualified taxonomist for identification.

#### **5.4 DATA VERIFICATION, VALIDATION AND USABILITY**

Data verification and validation will be conducted by qualified biologists (e.g., QA manager or field/lab supervisors) during the course of the project to ensure that the resulting data will be suitable for use as intended. Project records, including field sampling logs, raw data sheets, sample chain-of-custody forms and instrument calibration logs, will be reviewed to verify that data were collected according to the QAPP. Data will be validated first by a review of datasheets and data files to find whether data are incomplete or appear to be inappropriate or out of a reasonable range of values. Data entry into the database also will undergo a 100 percent visual QC comparison to the data on the corresponding data sheets. Finally, data files will be subjected to error checking programs to detect outlying values to either investigate further or eliminate if shown to be spurious. This investigation will require tracing the data to raw data sheets and consulting with field or lab personnel who recorded the data. All raw data sheets, log books and data files will be maintained for future reference. All computer files will be backed up on a daily basis while any data entry or editing procedures are ongoing.

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WIMB Rec'd FEB 03 2005

STATE OF MISSOURI  
DEPARTMENT OF NATURAL RESOURCES

Matt Blunt, Governor • Michael D. Wells, Acting Director

www.dnr.mo.gov

January 20, 2005

Mr. Michael Smallwood  
Ameren Services  
One Ameren Plaza, 1901 Chouteau Avenue  
P.O. Box 66149  
St. Louis, MO 63166-6149

Dear Mr. Smallwood:

We have received the Ameren UE, Meramec Power Plant (MO-0000361) Proposal for Information Collection dated January 7, 2005, as required by Section 316(b) of the Clean Water Act and at 40 CFR 125.95(b)(1).

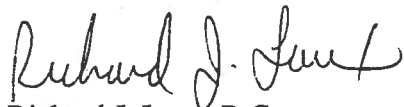
The Proposal for Information Collection provides a description of the information to be used to support the Comprehensive Demonstration Study required by Section 316(b) of the Clean Water Act.

The Proposed Impingement Monitoring Section (Chapter 4 of the document) outlines the actual methodology to be used by Ameren UE to prepare the Impingement Mortality Characterization Study as required by Section 316(b) of the Clean Water Act.

Your study plan sequence and methodology is approved. If you have any questions contact me at (573) 751-6982 or by mail at P.O. Box 176, Jefferson City, Missouri 65102.

Sincerely,

WATER PROTECTION PROGRAM



Richard J. Laux, R.G.  
Permit Unit Chief

RJL:tsl

c: Mr. John Dunn, U.S. EPA Region VII

NPDES  
- MO  
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x 7594

*Integrity and excellence in all we do*

